

**REMARKS**

Claims 1, 3-5, 7-14 and 19-35 are all the claims pending in the application. Claims 2, 6 and 15-18 have been deleted. Claims 4 and 10 have been amended to correct the dependency to recite Claim 1. For clarification purposes, Claim 25 has been amended to recite the definitions of the terms  $A^1$ ,  $R^1$ ,  $R^2$ ,  $R^3$ ,  $n$ ,  $A^2$ ,  $R^4$ ,  $R^5$ ,  $R^6$ , and  $m$ , as recited in Formulae (I) and (II). Claim 31 has been amended to recite the definitions of the terms recited in Formula (VI). Thus, no new matter has been added.

**A. Response to Claim Rejections Under 35 U.S.C. § 112**

**1. Claim 10**

Claim 10 has been rejected under 35 U.S.C. § 112, second paragraph, as the recitation of “claim 2” allegedly is unclear, as Claim 2 has been cancelled. *See* Office Action at page 3, paragraph 6. Applicants have corrected the dependency of Claim 10 to recite Claim 1. Thus, it is respectfully requested this rejection be withdrawn.

**2. Claims 25-35**

Claims 25-35 have also been rejected under 35 U.S.C. § 112, second paragraph, as allegedly unclear. Specifically, Claim 25 has been rejected as allegedly the following recited terms are unclear:  $A^1$ ,  $R^1$ ,  $R^2$ ,  $R^3$ ,  $n$ ,  $A^2$ ,  $R^4$ ,  $R^5$ ,  $R^6$ , and  $m$ . *See* Office Action at page 3, paragraph 6. Claim 31 has also been rejected as allegedly the recited term “ $A_z^4TiB_{4-z}^2$ ” is not clear. *See id.* Applicants have amended Claim 25 to recite the definitions for  $A^1$ ,  $R^1$ ,  $R^2$ ,  $R^3$ ,  $n$ ,  $A^2$ ,  $R^4$ ,  $R^5$ ,  $R^6$ , and  $m$ , recited in Formulae (I) and (II), and Claim 31 to recite the definitions for the terms recited in Formula (VI). Thus, it is respectfully requested this rejection be withdrawn.

**B. Response to Claim Rejections Under 35 U.S.C. § 103(a)**

***A. Haynes, in view of Ishikawa***

Referring to pages 4-6, paragraph 7 of the Office Action, Claims 1, 3-5, 7-14, 19-21, 24-28, 30-31 and 33-35 have been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over EP 067 468 to Haynes (the Examiner cites to the U.S. equivalent, U.S. Patent No. 4,379,891) (“Haynes”) (reference herein is made to U.S. Patent ‘891), in view of U.S. Patent No. 6,191,247 to Ishikawa (“Ishikawa”).

Applicants traverse for the following reasons. The combination of Haynes and Ishikawa fail to disclose, suggest, or otherwise render obvious the recited features of the present claims, as discussed below.

1. Claims 1, 3-5, and 7-11

Haynes in view of Ishikawa fail to disclose, suggest, or otherwise render obvious the recited subject matter of Claims 1, 3-5 and 7-11, for the following reasons.

Neither Haynes nor Ishikawa disclose, suggest or otherwise render obvious a condensation accelerator that accelerates the condensation of modified polymers in a polymerization system, as taught by the present invention. Haynes discloses that compositions containing modified polymers may be obtained with coupling agents such as a gamma-glycidoxypyrpyl-trimethoxy silane (GPTS). *See* Haynes at col. 1, ll. 58-65. Ishikawa discloses that “a silanol condensation catalyst is blended into the rubber composition in which silica and a silane coupling agent and/or a polysiloxane containing alkoxysilyl groups are blended, the silanol condensation catalyst accelerates the reaction of the silanol groups on the surface of the silica particles and the silane coupling agent and alkoxypolysiloxane and causes the silane

coupling agent or alkoxypolysiloxane to quickly cover the surface of the silica particles.” See  
Ishikawa at col. 12, ll. 12-21 (emphasis added).

In the present invention, two modification reactions are conducted. The first modification reaction is the modification of a polymer by reacting an active site thereof with a hydrocarbyloxysilane compound. The second modification reaction is a condensation of the modified polymer by adding a condensation accelerator (one of the silanol condensation catalysts) to the reaction system. In the second modification reaction, the condensation accelerator accelerates the condensation of modified polymers in a polymerization system.

However, the condensation catalyst described in Ishikawa accelerates the reaction of the silanol groups with the surface of silica particles in a mixing stage of a rubber composition. Accordingly, the claimed condensation of modified polymers in a polymerization system is not conducted by the method described in Haynes in view of Ishikawa.

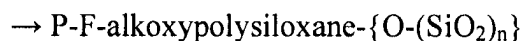
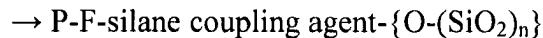
2. Claim 12

First, Haynes discloses an uncondensed modified polymer - not a condensed polymer, as recited in the present claims. Further, Haynes in view of Ishikawa results in a modified polymer-silica composite.

On the other hand, in the present invention, the modified polymer is condensed at the modified moiety of the polymer, and the molecular weight increases. The increased molecular weight of the polymer prevents cold flow of the polymer. It also results in improved handling of the polymer, as well as improved reactivity of the polymer with silica. Haynes in view of Ishikawa fails to disclose, suggest or otherwise render obvious this modified polymer, as encompassed by present Claim 12.

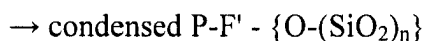
3. Claims 14, 19-20, 21, 25-28, 30-31 and 33-35

The reaction taught by Haynes in view of Ishikawa is completely different from that of the present invention. In Ishikawa, the following reaction of P-F (a silane coupling agent or alkoxypolysiloxane) and silica having silanol groups  $\{(\text{HO}-(\text{SiO}_2)_n\}$  takes place:



where the modified polymer is denoted by P-F; P denotes polymer chain; and F denotes functional moiety derived from a silane coupling agent.

On the contrary, in the present invention, a condensation accelerator (one of the silanol condensation catalysts) accelerates the condensation of modified polymers. The reaction of condensed P-F' and silica having silanol groups  $\{(\text{HO}-(\text{SiO}_2)_n\}$  that takes place in the present invention is as follows:



The condensed polymer is directly reacted with silica.

where the modified polymer is denoted by P-F'; and F' denotes functional moiety derived from a silane coupling agent. Additionally, this reaction results in excellent dispersibility of the silica into a rubber composition, without bad effects to the physical properties of the cured rubber composition. However, this reaction is not disclosed, suggested or otherwise rendered obvious by the reaction taught by Haynes in view of Ishikawa.

Thus, in view of the above, it is respectfully submitted that Haynes in view of Ishikawa fail to disclose, suggest or otherwise render obvious Claims 1, 3-5, 7-14, 19-21, 24-28, 30-31 and 33-35. Accordingly, it is respectfully requested that the rejection of the claims be withdrawn.

***B. Haynes, in view of Ishikawa, further in view of Materne***

Claims 23 and 32 have been rejected under as allegedly being unpatentable over Haynes, in view of Ishikawa, and further in view of U.S. Patent No. 6,403,693 to Materne (“Materne”). See Office Action at page 6, paragraph 8.

Applicants traverse for the following reasons.

As discussed above, Haynes discloses a modified polymer reacted with a modifier such as a gamma-glycidoxypopyl-trimethoxy silane (GPTS) coupling agent. Ishikawa discloses dibutyl tin dilaurate as a silanol condensation catalyst which accelerates the reaction of the silanol groups on the surface of the silica particles with the silane coupling agent or alkoxypolysiloxane. See Ishikawa at col. 12, ll. 12-24, 29. However, Ishikawa fails to disclose tin bis(2-ethylhexanoate) and titanium alkoxide (including, titanium tetrakis(2-ethylhexyl oxide)).

Materne fails to satisfy the deficiencies of Haynes and Ishikawa. Materne discloses bis(2-ethylhexanoate) tin, as a metal salt condensation reaction promoter. See Materne at col. 7, ll. 12-15. However, Materne discloses that, “For example, it is hypothesized that utilization of a bis-(trialkoxysilane) polysulfide compound, preferably a bis-(trialkoxysilane) disulfide compound, in combination with a silane condensation reaction promoter for enhancing a reaction of the bis-(trialkoxysilane) polysulfide compound with silanol groups on the silica-based filler and, also, alkoxy moieties of the trialkoxysilane polysulfide compound, react to form a polysiloxane which in turn, may lead to formation of a polysiloxane network at the surface of the filler and/or within the elastomer.” See Materne at col. 6, ll. 4-14. Thus,

Materne discloses that the elastomer-filler composite has a polysiloxane network, similar to that disclosed in Ishikawa.

On the contrary, the present invention seeks to condense a modified polymer and another modified polymer. Thus, the combination of Haynes, Ishikawa and Materne fail to disclose the recited modified polymer.

Thus, in view of the above, it is respectfully submitted that Haynes, in view of Ishikawa and Materne, fail to disclose, suggest or otherwise render obvious Claims 23 and 32. Accordingly, it is respectfully requested that the rejection of the claims be withdrawn.

**C. Ozawa, in view of Ishikawa**

Claims 1, 3-5, 7-14, 19-21, 24-28, 30-31 and 33-35 have been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over WO 01/34658 to Ozawa ("Ozawa") (the Examiner cites to the U.S. equivalent, U.S. Patent No. 6,992,147), optionally in view of Ishikawa. *See* Office Action at paragraph 9, pages 7-9.

Applicants traverse for the following reasons.

Ozawa discloses a pseudo-living polymer by coordination polymerization with a lanthanide-based catalyst. *See* Ozawa at col. 5, ll. 38-41. The physical properties of the pseudo-living polymer are quite different from those of a polymer by anion polymerization using an alkaline metal compound and/or an alkaline earth metal compound as a polymerization initiator, as recited in the present claims.

It is stated in the Office Action that "Applicants are advised that Ishikawa's silanol condensation catalyst is blended in a dry mixing stage for the rubber composition. As such, it is indeed added to the reaction system after completion thereof." However, in the present

invention, a condensation accelerator is added in the middle of the first modification reaction or after the first modification reaction, and before the second modification reaction (condensation reaction) in the reaction system to accelerate the condensation reaction.

Further, there is no silica in the reaction system of the present invention. So polymer-filler condensation cannot be conducted in the reaction system of the present invention.

Thus, in view of the above, it is respectfully submitted that Ozawa, in view of Ishikawa, fail to disclose, suggest or otherwise render obvious Claims 1, 3-5, 7-14, 19-21, 24-28, 30-31 and 33-35. Accordingly, it is respectfully requested that the rejection of the claims be withdrawn.

***D. Ozawa, in view of Ishikawa, further in view of Materne***

Claims 23 and 32 have been rejected as allegedly being unpatentable over Ozawa, optionally in view of Ishikawa, and further in view of Materne. *See* Office Action at page 9, paragraph 10.

Applicants traverse for the following reasons.

As discussed above, Ozawa discloses the use of a condensation catalyst in liquid polymerization system. On the other hand, Ishikawa and Materne disclose the use of a condensation catalyst in a mixing stage of silica and modified polymer. Thus, the combination of Ozawa, optionally in view of Ishikawa, and further in view of Materne is improper, as there is no technical relevance between Ozawa and Ishikawa or Materne.

Thus, in view of the above, it is respectfully submitted that Ozawa, optionally in view of Ishikawa, and further in view of Materne, fail to disclose, suggest or otherwise render obvious Claims 23 and 32. Accordingly, it is respectfully requested that the rejection of the claims be withdrawn.

***E. Takeichi '908, in view of Ishikawa***

Claims 1, 3-5, 7-14, 19-22, 24-31 and 33-35 have been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 6,228,908 to Takeichi ("Takeichi '908") in view of Ishikawa. *See* Office Action at paragraph 11, pages 10-11.

Applicants traverse for the following reasons.

Takeichi '908 discloses a polymer modified with an hydroxysilane compound selected from the group consisting of unsubstituted and substituted tetraalkoxysilane compounds, alkylalkoxysilane compounds, arylalkoxysilane compounds, alkenylalkoxysilane compounds, and halogeno-alkoxysilane compounds and a rubber composition having the polymer.

However, in Takeichi '908, the modification of a living polymer (first modification reaction) is completed without a condensation catalyst of Ishikawa, and a condensation reaction (second modification reaction) cannot be conducted. In any event, even if a condensation catalyst as disclosed in Ishikawa, is added in the mixing stage of a rubber composition of Takeichi '908, a polymer-filler condensation is conducted in the mixing stage, and a condensed polymer cannot be obtained.

In the Office Action, it is asserted, "Applicants are advised that Ishikawa' silanol condensation catalyst is blended in a dry mixing stage for the rubber composition. As such, it is indeed added to the reaction system after completion thereof." However, in the present invention, a condensation accelerator is added in the middle of the first modification reaction or after the first modification reaction, and before the second modification reaction (condensation reaction) in the reaction system to accelerate the condensation reaction.



Further, there is no silica in the liquid reaction system of the present invention. So a polymer-filler condensation cannot be conducted in the liquid reaction system of the present invention.

Thus, in view of the above, it is respectfully submitted that Takeichi '908 in view of Ishikawa, fail to disclose, suggest or otherwise render obvious Claims 1, 3-5, 7-14, 19-22, 24-31 and 33-35. Accordingly, it is respectfully requested that the rejection of the claims be withdrawn.

***F. Takeichi '908, in view of Ishikawa, and further in view of Materne***

Claims 23 and 32 have been rejected as allegedly being unpatentable over Takeichi '908, in view of Ishikawa, and further in view of Materne. *See* Office Action at paragraph 12, page 12.

Applicants traverse for the following reasons.

As discussed above, Takeichi '908 fails to disclose the use of a condensation catalyst in liquid polymerization system. Ishikawa and Materne disclose the use of a condensation catalyst in a mixing stage of silica and modified polymer. Thus, the combination of Takeichi '908, in view of Ishikawa, and further in view of Materne is improper, as there is no technical relevance between Takeichi '908 and Ishikawa or Materne.

Thus, in view of the above, it is respectfully submitted that Takeichi '908, optionally in view of Ishikawa, and further in view of Materne, fail to disclose, suggest or otherwise render obvious Claims 23 and 32. Accordingly, it is respectfully requested that the rejection of the claims be withdrawn.

***G. Hogan in view of Ishikawa***

Claims 1, 3-5, 7-14, 19-22, 24-31 and 33-35 have been rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,573,412 to Hogan ("Hogan") in view of Ishikawa. See Office Action at paragraph 13, pages 12-14.

Applicants traverse for the following reasons.

As acknowledged by the Examiner, Hogan fails to disclose a condensation accelerator. Accordingly, a second modification reaction (polymer condensation reaction) cannot be conducted in the polymers disclosed by Hogan. Applicants rely upon the above discussion regarding Ishikawa, and submit that Ishikawa fails to satisfy the deficiencies of Hogan.

Thus, in view of the above, it is respectfully submitted that Hogan, in view of Ishikawa, fail to disclose, suggest or otherwise render obvious Claims 1, 3-5, 7-14, 19-22, 24-31 and 33-35. Accordingly, it is respectfully requested that the rejection of the claims be withdrawn.

***H. Hogan, in view of Ishikawa, and further in view of Materne***

Claims 23 and 32 are rejected as allegedly being unpatentable over Hogan, in view of Ishikawa, and further in view of Materne. See Office Action at paragraph 14, pages 14-15.

Applicants traverse for the following reasons.

As discussed above, the Examiner acknowledges that Hogan fails to disclose a condensation accelerator. As such, a second modification reaction (polymer condensation reaction) cannot be conducted in the polymers disclosed by Hogan. Applicants rely upon the above discussion regarding Ishikawa and Materne, and submit that Ishikawa and Materne fail to satisfy the deficiencies of Hogan.

Thus, in view of the above, it is respectfully submitted that Hogan, in view of Ishikawa and Materne, fail to disclose, suggest or otherwise render obvious Claims 23 and 32.

Accordingly, it is respectfully requested that the rejection of the claims be withdrawn.

***I. Morita, in view of Ishikawa***

Claims 1, 3-5, 7-14, 19-22, 24-31 and 33-35 have been rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over U.S. Patent No. 6,369,167 ("Morita"), in view of Ishikawa. See Office Action at paragraph 15, pages 15-17.

Applicants traverse for the following reasons.

As acknowledged by the Examiner, Morita fails to disclose a condensation accelerator. Accordingly, a second modification reaction (polymer condensation reaction) cannot be conducted in the polymers disclosed by Morita. Applicants rely upon the above discussion regarding Ishikawa, and submit that Ishikawa fails to satisfy the deficiencies of Morita.

Thus, in view of the above, it is respectfully submitted that Morita, in view of Ishikawa, fail to disclose, suggest or otherwise render obvious Claims 1, 3-5, 7-14, 19-22, 24-31 and 33-35. Accordingly, it is respectfully requested that the rejection of the claims be withdrawn.

***J. Morita, in view of Ishikawa, and further in view of Materne***

Claims 23 and 32 are rejected as being unpatentable over Morita, in view of Ishikawa, and further in view of Materne. See Office Action at paragraph 16, pages 17-18

Applicants traverse for the following reasons.

As discussed above, the Examiner acknowledges Morita fails to disclose a condensation accelerator. As such, a second modification reaction (polymer condensation reaction) cannot be

conducted in the polymers disclosed by Morita. Applicants rely upon the above discussion regarding Ishikawa and Materne, and submit that Ishikawa and Materne fail to satisfy the deficiencies of Morita.

Thus, in view of the above, it is respectfully submitted that Morita, in view of Ishikawa, and further in view of Materne, fail to disclose, suggest or otherwise render obvious Claims 23 and 32. Accordingly, it is respectfully requested that the rejection of the claims be withdrawn.

***K. Takeichi '295, in view of Ishikawa***

Claims 1, 3-5, 7-14, 19-21 and 22, have been rejected as allegedly being unpatentable over U.S. Patent No. 6,008,295 to Takeichi ("Takeichi '295") in view of Ishikawa. *See* Office Action at paragraph 17, pages 18-20.

Applicants traverse for the following reasons.

As acknowledged by the Examiner, Takeichi '295 fails to disclose a condensation accelerator. Accordingly, a second modification reaction (polymer condensation reaction) cannot be conducted in the polymers disclosed by Takeichi '295. Applicants rely upon the above discussion regarding Ishikawa, and submit that Ishikawa fails to satisfy the deficiencies of Takeichi '295.

Thus, in view of the above, it is respectfully submitted that Takeichi, in view of Ishikawa, fail to disclose, suggest or otherwise render obvious Claims 1, 3-5, 7-14, 19-21 and 22. Accordingly, it is respectfully requested that the rejection of the claims be withdrawn.

***L. Takeichi '295, in view of Ishikawa, further in view of Materne***

Claims 23 and 32 have been rejected as allegedly being unpatentable over Takeichi '295, in view of Ishikawa, and further in view of Materne. *See* Office Action at paragraph 18, page 20.

Applicants traverse for the following reasons.

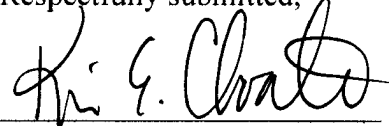
As discussed above, the Examiner acknowledges Takeichi '295 fails to disclose a condensation accelerator. As such, a second modification reaction (polymer condensation reaction) cannot be conducted in the polymers disclosed by Takeichi '295. Applicants rely upon the above discussions regarding Ishikawa and Materne, and submit that Ishikawa and Materne fail to satisfy the deficiencies of Takeichi '295.

Thus, in view of the above, it is respectfully submitted that Takeichi '295, in view of Ishikawa and further in view of Materne, fail to disclose, suggest or otherwise render obvious Claims 23 and 32. Accordingly, it is respectfully requested that the rejection of the claims be withdrawn.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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